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Divestitures, privatization and corporate performance in emerging markets

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Abstract

We use new firm-level data to examine the effects of firm divestitures and privatization on corporate performance in a rapidly emerging market economy. Unlike the existing literature, we control for accompanying ownership changes and the fact that divestitures and ownership are potentially endogenous variables. We find that divestitures increase the firm's profitability but do not alter its scale of operations, while the effect of privatization depends on the resulting ownership structure – sometimes improving performance and sometimes bringing about decline. The effects of privatization are thus more nuanced than suggested in earlier studies. Methodologically, our study provides evidence that it is important to control for changes in ownership when analyzing divestitures and to control for endogeneity, selection and data attrition when analyzing the effects of divestitures and privatization.

JEL classifications: D23, G32, G34, L20, M21, P47.
Keywords: divestiture, breakups, privatization, corporate performance, emerging markets, endogeneity.

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1. Introduction

Corporate divestitures (including asset sales, spin-offs, breakups and carve-outs) play an important part in advanced market economies and they have been widely researched in the literature. In this paper, we use a new firm-level dataset from a model transition economy (the Czech Republic) to estimate the respective effects of divestitures and privatization on corporate performance. The dataset is unique in that we know the identity of firms and observe values of indicators of corporate performance for the divested units (representing all parts of the parent company) both before and after the divestiture by the parent firm. Since we also have the corresponding data for firms that did not experience any divestitures, we can carry out an analysis that has not been performed in either the advanced or emerging market context before. Moreover, since we have data for variables from the pre-transition period when central planners exogenously set the values of firm-level variables, we can construct relatively credible instrumental variables (IVs) to control for endogeneity of divestitures and changes in ownership. We thus provide evidence on the performance effect of divestitures and privatization that could not be carried out before. We find that divestitures increase the firm's profitability but do not alter its scale of operations, while the effect of privatization depends on the resulting ownership structure – sometimes improving and sometimes worsening the firm's performance.

The existing literature analyzes divestitures from a number of angles. Hausman, Tardiff and Belinfante (1993) show in the US context that the breakup of a nation-wide telephone company brought about opportunity for gains in economic efficiency, while Slade (1998) examines the efficiency effects of divestiture of a large number of breweries in the UK. There is evidence that parent companies experience positive cumulative abnormal excess returns at the announcement of a spin-off (for example, Hite and Owers, 1983; Miles and Rosenfeld, 1983; Schipper and Smith, 1983) and that both the spun-off units and parent firms have positive abnormal returns after the spin-off and experience significantly more takeovers than similar firms with no spin-offs (Cusatis, Miles and Woolridge, 1993). Daley, Mehrotra and Sivakumar (1997) and Woo, Willard and Daellenbach (1992) show that spin-offs record improvements in operating performance, while John and Ofek (1995) show that divestiture-driven improvement in operating performance occurs primarily in firms that increase their focus. Similarly, with respect to the corporate focus hypothesis, Dittmar and Shivdasani (2003) find that after divestiture parent companies improve internal allocation of capital and increase their rate of investment. Overall, the literature suggests that in the advanced economies divestitures increase value and improve performance, but also have important distributional effects.

From the methodological standpoint, the literature has limitations that represent a challenge for ongoing and future research. First, the existing studies treat divestitures as exogenous rather than using, for example, IV estimation to control for their potential endogeneity. Second, in many studies the data do not permit researchers to compare the performance of the divested units before and after the

divestiture. Third, while Cusatis, Miles and Woolridge (1993) provide evidence that changes in the structure of ownership after divestitures increase the firm's rate of return, the rest of the literature does not control for ownership changes that occur with divestitures. Since the aforementioned endogeneity and omitted variable issues may have produced biased estimates of the effects of divestitures, the next step in the literature is to tackle these problems. In the present study, we take on these methodological issues.

In addition to being consequential in advanced countries, divestures are also important in the transition and emerging market economies. Divestitures in emerging markets are also frequently observed together with privatization and the two phenomena represent a key form of corporate restructuring as enterprises divest themselves of divisions or literally break up into two or more units. In this context, it may be hypothesized that divestitures and privatization improve corporate performance as the new firms strive to gain reputation and introduce superior governance. As the originally underdeveloped legal and institutional framework improves in emerging market economies, divestitures and certain types of corporate ownership may enhance performance by serving as a disciplining device for management. The theoretical model developed by Chemmanur and Yan (2004) is relevant in this setting because it shows how divestitures may increase the probability of a takeover by value-improving management that enhances operating performance after the divestiture. Similarly, evidence given by Cusatis, Miles and Woolridge (1993) in an advanced country context that ownership structure after divestiture affects positively the firm's rate of return suggests that the challenge is to estimate the respective effects of divestiture and ownership changes when assessing post-divestiture performance.

Although divestitures constitute important phenomena in the transition and emerging market economies, a lack of adequate data has prevented researchers from analyzing them. An exception is Lizal, Singer and Svejnar (2001), who use Czech data from the start of the transition to show that small and medium sized divestitures have positive effects on productive efficiency and profitability of both the parent companies and divested units in the year when the division occurs. These findings need to be interpreted with caution, however, given the limited data available at the time of this study. The authors for instance do not know the identity of firms and have to use indirect methods to identify divestitures and link the divested units to the parent firms. Moreover, the authors can follow the firms only during the year of the breakup (1991) and the following year (1992). This prevents them from evaluating the medium- and long-term effects of divestitures. It also does not allow them to estimate the effects of privatization since it had not yet taken place. Since we have richer data with a longer time span, we are able to overcome these shortcomings and credibly estimate the effects of post-divestiture restructuring and privatization.

The literature on the effects of privatization in the transition and emerging market economies is substantial (see, for example, Boycko, Shleifer and Vishny,

1996 and Roland, 1994, for theoretical treatments; and Djankov and Murrell, 2002, Estrin *et al.*, 2007, Megginson and Netter, 2001, for empirical surveys). However, most studies do not control adequately for the fact that firms are unlikely to be assigned for privatization at random and the estimated effects may hence be biased (see Gupta, Ham and Svejnar, 2008). In particular, Djankov and Murrell (2002) point out that 47 percent of the studies surveyed in their paper do not control for endogeneity or selection problems at all. From this perspective, the Czech Republic constitutes a particularly useful laboratory for analyzing the effects of divestitures and privatization on financial and economic performance in emerging markets. During the late 1980s and early to mid-1990s the country had many features found in other emerging market economies, but the variation in the values of the relevant variables was much greater. Hence, while emerging market economies are usually characterized by a transition from significant to less pronounced state ownership, with divestitures being one of the mechanisms of corporate restructuring, in the Czech Republic these processes were much more pronounced than in most other economies. The country started in 1990 as an almost completely state-owned, controlled and trade-protected economy, with its corporate sector being dominated by large state-owned enterprise (SOE) conglomerates. It rapidly opened itself to trade, liberalized prices and privatized its SOEs, so that by 1995 it was an overwhelmingly privately owned market economy. In the process, most of the large SOE conglomerates were broken up and the number of medium and large industrial firms more than tripled on account of numerous divestitures, as well as the entry of newly created firms.

The structural and institutional features observed in the emerging market economies in general, and the Czech Republic in particular, lead us to test two competing hypotheses with respect to divestitures and privatization:

1. Divestitures and privatization have a positive effect on the performance of the resulting units by eliminating inefficiencies such as diseconomies of scale of large SOEs, weak managerial incentives and information asymmetries that existed prior to economic liberalization and reduction of state control;
2. Divestitures and privatization have a negative effect on the performance of the resulting units because of the weak corporate governance, waning government coordination and regulation, unclear property rights, and underdeveloped legal and institutional framework that exist in emerging market economies.

With respect to privatization, we also test whether the nature of the effect depends on the type of the new ownership structure. In particular, we are able to distinguish the extent to which each firm is owned by an industrial (that is, non-financial) firm, financial company, individual owner, or state, and we can estimate the effect of different ownership patterns on corporate performance.

We find that divestitures and privatization have a number of significant but also some insignificant effects on corporate performance. The average divestiture

increases the firm's profitability and scale of operations (sales), while the effect of privatization depends on the resulting ownership structure. The overall evidence for divestitures is consistent with our first hypothesis, namely that divestitures have a positive effect on performance. Reducing state ownership is positive for some performance indicators but insignificant or even negative for others. Industrial firms as owners improve, or do not hamper, performance and in that sense they behave consistently with our first hypothesis. Financial companies and individuals as owners are mostly associated with no improvement and in some cases significant declines in performance, thus providing evidence that is consistent with the second hypothesis. The effects of privatization are hence found to be less positive and more nuanced than has been suggested in many of the early studies. Methodologically, we show that it is important to control for changes in ownership when analyzing the effect of divestitures and control for endogeneity, selection and data attrition when analyzing the effects of divestitures and privatization.

The paper is structured as follows. In Section 2 we outline the institutional setting underlying our analysis, stylized model and our estimation strategy. In Section 3 we present our data, variables and the method for identifying divestitures. Section 4 describes our estimating framework, including the IVs that we use. We present our empirical results in Section 5 and draw conclusions in Section 6.

2. The institutional setting and estimation strategy

In this section we outline the main features of the institutional setting in which the wave of divestitures and privatization in the Czech Republic took place and present our strategy for estimation.

2.1 The institutional setting

The divestitures took place mostly during the privatization program that was carried out in the first half of the 1990s under three different schemes: restitution, small-scale privatization and large-scale privatization. The first two schemes started in 1990 and were most important during the early years of the transition. Large-scale privatization, by far the most important scheme, began in 1991 and was completed in early 1995.[1] Small firms were usually auctioned or sold in tenders. Many medium-sized businesses were sold in tenders or to predetermined buyers in direct sales. Most large and many medium-sized firms were transformed into joint stock companies and their shares were distributed through voucher privatization (almost

[1] The privatization process has been extensively described and analyzed. See for example, Filer and Hanousek (2001) and Kočenda (1999). For development of ownership structures in voucher-privatized firms, see Kočenda and Valachy (2002).

one-half of the total number of all shares of all joint stock companies was privatized in the voucher scheme), sold in public auctions or to strategic partners, or transferred to municipalities. The voucher scheme was part of the large-scale privatization process and two waves of voucher privatization took place in 1992–1993 and 1993–1994, respectively. The early post-privatization ownership structure emerged as shares from the first and second wave were distributed in 1993 and early 1995, respectively. During this period there was also significant post-privatization share trading (often off the official stock market) among large shareholders.

Privatization of each enterprise was based on an officially accepted privatization project. The management of each enterprise was obliged by law to submit a privatization proposal, but any domestic or foreign firm, institution or individual could present a competing privatization project. In reality, there was more than one privatization proposal submitted for numerous enterprises. All proposals were to be considered on an equal footing by the privatization authorities, which worked with the investors to ensure that the final submitted proposals reflected at least in part government objectives in terms of ownership structure and other characteristics.

The decisions on divestitures were taken by the relevant government ministries in conjunction with the government privatization authority. The decision for each firm was based on the winning privatization project that outlined the proposed framework for the divestiture(s). On average almost 9 projects were submitted per firm (the median was 5); the projects were approved at an average rate of close to 3 per firm (the median was 2), reflecting the divestitures as well as government objectives (see Kotrba and Svejnar, 1994). Table 1 summarizes information about the privatization projects and shows that the impulse to privatize originated from management as well as other parties.[2] Since management was required to submit a privatization proposal, it comes as no surprise that 25 percent of all projects came from this source. Independent bidders that wanted to privatize by purchasing (a part of) a firm submitted two-fifths (39 percent) of all projects.

2.2 *The estimation strategy*

Before presenting our formal model, we note that initial conditions, the nature of the divestiture, and the change in ownership may all affect subsequent corporate performance. Moreover, initial conditions are also likely to influence the nature of the divestiture and privatization. Therefore, in analyzing the effects of divestitures,

[2] Privatization of each state-owned firm was decided on the basis of an officially accepted privatization project. According to the law, all state-owned enterprises were selected either for the first or the second privatization wave, or they were temporarily exempted. Each selected firm had to submit an official privatization proposal that was usually crafted by the firm's management under the tutelage (and responsibility) of its sectoral ministry. Any domestic or foreign corporate body or individual was allowed to present a competing project that was to be considered on an equal footing to the official one.

Table 1. Proposers of privatization projects in the Czech Republic

Project submitted by	Total	Percentage (%)
Management of company	2,813	25
Management of plants	450	4
Bidders for purchase of company	4,388	39
District privatization commission	788	7
Restitution claimants	450	4
Local Government	450	4
Consulting firms	338	3
Others	1,575	14
Total	11,252	100

***Notes*:** (i) Bidders for purchase of company are proposers of competing projects who wish to purchase the company. (ii) Consulting firms submit projects proposing sales to other entities or applying to get a contract for organizing a tender or auction. Total number of firms equals 2,404.
***Source*:** Sourced from Kotrba and Svejnar (1994).

we benefit from the fact that we can identify the parent company and the (to be) divested units within it (that is, all the operating units of the parent company).

In view of the institutional setting, we model corporate performance as a function of the presence or absence of a divestiture and the type of ownership structure. Since the explanatory variables related to divestitures and ownership structure may be endogenous, we use IVs in estimation. In particular, we use a logit equation to model the divestiture of a company and subsequent changes in its ownership structure, with the explanatory variables being predetermined and exogenous with respect to the divestiture and privatization. We then use the predicted values from the logit as instruments in our model of corporate performance.[3] The task of finding legitimate explanatory variables for the logit regression is not simple because divestitures and ownership changes may be systematically related to unobserved firm characteristics. In Section 4 we introduce our explanatory variables and show

[3] The main specification models corporate performance where endogenous variables are divestiture and ownership structure. In a classic case one could estimate the main model with an appropriate set of instruments (to instrument for endogeneity of divestiture and ownership). Alternatively, we know that this approach is equivalent to a two-stage least squares. This means that in a first stage one would estimate separate models for divestiture and ownership structure, and use predicted values as instruments for the main specification in the second stage. Both approaches are identical when the least-square method is employed. However, since divestiture and ownership are 0/1 variables we prefer to use a limited dependent variables technique in the first stage.

that they are likely to satisfy the formal requirements. To address selection bias arising from data attrition over time, we use a Heckman (1979) procedure to estimate a selection equation and insert the resulting Mills ratio as a regressor in the corporate performance equation.

3. Data, identification of divestitures, and definitions of variables

The data were compiled by the authors from Aspekt, a commercial database, and from the archives of the Ministry of Privatization and the National Property Fund of the Czech Republic. Table 2 summarizes all variables available along with the periods, source, and accounting standards (for financial variables). The data allow us to identify unambiguously the parent enterprises and all new units related to a surge of divestitures that occurred in 1991–1992. Prior to voucher privatization, 44 firms were broken up into 131 new firms that subsequently entered the first wave of the voucher scheme; these new firms received new tax identification numbers and had the same rights to use the brand and/or trade name of the former parent enterprise. Thus, out of the 988 firms that entered the first wave of voucher privatization, we use these 131 firms newly created as a result of numerous divestitures, plus 780 firms that did not experience division and constitute our control group. This means that there are only 77 firms (8 percent of the total) for which the data are dubious due to legal problems associated with privatization, and we do not include them in our sample. Finally, the set of firms that were divested from large industrial conglomerates is a subset of the privatized firms. The decision to privatize the divested units was taken at the same time as that of their divestment. Hence, privatization is not nested with respect to divestiture in our sample and our estimation is not constrained in any way.

Based on the identified ownership structure available from our data, we assign firm ownership corresponding to the following categories of owners: the state, industrial firm, individual owner, or financial company. We can clearly link parent firms with divested units and have performance data and firm characteristics of all the units both after the division and before, when they were still parts of the original parent enterprise.[4] We use this information in constructing variables measuring the size of the divestiture and in carrying out a difference-in-differences (DID) analysis as a robust check of the baseline model.

For each firm in our dataset, we have detailed information derived from all the proposed privatization projects that were submitted to the government before privatization. This includes the relevant information about the divestiture, the links

[4] Under the US accounting rules, data related to sales, assets, operating profit, and number of employees are available for subsidiaries and operating units before and after the divestitures for operating units representing at least 5 percent of a firm's business. It seems that the availability of these data has not been fully exploited in the literature, perhaps because of the absence of data related to costs.

Table 2. Variables and data sources

Variable	Data available in the period		Period and source
	Before divestiture	After divestiture	
Performance indicators			
Baseline model: Labour costs/sales, profit/labour costs, profit/equity	–	**yes**	1995–1996, IAS
Difference-in-difference model: Sales	yes	**yes**	1989–1991, Ministry of Privatization (MoP), LAS, 1995–1996, Aspekt, IAS
Ownership data			
State, Individual owner, Financial co., Industrial co. (percentage of the total)	–	**yes**	1995–1996, Aspekt
Instrumental and control variables			
Share of labour and capital (divestiture units on parental company)	yes		1989–1991, Ministry of Privatization (MoP), LAS
Capital, Profit, Sales, Total liabilities, No. of employees	yes	**yes**	1989–1991, (MoP), LAS
Number of privatization projects	yes	**n.a.**	1989–1991, MoP
Proposed ownership structure (winning project): Foreign, domestic	yes	**n.a.**	1989–1991, MoP
Identification of the split	yes	**yes**	1989–1991, MoP
Shares offered and distributed in the Voucher Privatization	yes	**yes**	1992, MoP
Company shares (percent) held by privatization funds and individuals	yes	**yes**	1992, MoP
Industrial dummies	yes	**yes**	1989–1991, MoP, 1995–1996, Aspekt
Identification of the split	yes	**yes**	1989–1991, MoP

***Notes*:** IAS stands for international accounting standards, LAS stands for local accounting standards and n.a. stands for not applicable.

between the parent company and divested units, the privatization scheme, and information on assets, liabilities, profit, sales, and number of employees in 1990. The number of privatization projects submitted for any given firm is *per se* an important factor for our analysis. For many SOEs there were several privatization projects submitted and their number was directly and primarily related to number of divisions within each firm or the number of units into which a firm could be naturally divided. Each privatization project reflected the structure of the firm, managers' motives, degree of investor interest, and expected future performance of the firm. For many firms, however, a number of proposals might be submitted to privatize a particular small asset that was not connected with the firm's production activity but that was in the firm's possession (for instance, a recreational facility). In order to avoid mixing these privatization projects with those covering principal productive activities, we only consider projects aiming at privatizing 5 percent or more of the enterprise's assets. Table 3 displays pre-divestiture 1990 economic indicators for the new units, parent firms and firms in the control group.

We also have data on the structure of share ownership among various domestic and foreign parties as proposed in the winning privatization projects. The share ownership variables include the share that the government intended to keep both in the short and in the long term. Short-term government ownership reflects the expectation that the government would be able to sell appreciated shares shortly after privatization, while long-term government ownership indicates an expectation of slower appreciation of the value of the privatized firm and/or its strategic character in the economy. Parts of the shares retained by the government were also classified as intended for restitution or future sale through an intermediary (see Table 4 for data on the allocation of shares for other purposes than voucher privatization).[5]

The sectoral distribution of firms is summarized in Table 5. The frequency of firms in the various sectors reveals that most firms belong to the sector of heavy machinery, reflecting the structure of the Czech economy under the command system. The firms in this sector were also most in need of restructuring and the divisions of large conglomerates were the start of this process. Thus, the distribution of the firms that underwent divisions is not uniform across sectors and we account for this in our estimation by including industry-specific dummy variables and dummy variables for size differences in particular sectors. We also exclude firms from the forestry sector since they represent rather atypical examples of privatization, often linked to political pressures due to various restitution claims.

To summarize, in analyzing corporate performance after the wave of divestitures and privatization, we use economic and financial indicators for the period 1995–1996. The divestitures occurred in 1991–1992, the accompanying privatization in 1992–1993, and the distribution of shares of the privatized firms and the major post-privatization swaps of shares in 1993–1994. Since for some of the firms the

[5] Mean proportion of shares allocated to various owners (other than through voucher scheme) sum-up to 15.7 percent for spun-off units and 15.5 percent for the control group of firms.

Table 3. Summary statistics of pre-divestiture indicators in 1990

	Mean	Standard deviation	Minimum	Maximum	Median	Number of firms
Parent enterprises						*44*
Profit	171.1	385	–271.8	2,050.2	20.2	44
Sales	1,847.8	2,698	60.0	14,500.0	686.1	44
Employment	2,434.7	3,729	175.0	23,138.0	1334.0	44
Assets	1,930.0	8,633	47.2	57,600.0	331.1	44
Liabilities	431.9	907	2.9	5,787.4	140.8	44
Number of Divestitures	2.98	1.5	2	9	2	44
Number of Projects	8.98	12.2	1	77	5	44
Firms without divestitures						*780*
Profit	73.7	658	–612.8	16,700.0	5.6	778
Sales	828.4	2,840	1.5	50,800.0	213.5	779
Employment	1,156	3,049	3	49,701	402	780
Assets	313.4	779	2.2	9,391.4	105.5	780
Liabilities	232.1	821	0.1	14,400.0	53.6	717
Number of Projects*	2.96	4.4	1	41	1	780
Divested units						*131*
Profit	57.9	212	–267.2	1,874.4	4.7	130
Sales	620.6	1,501	6.2	13,100.0	133.9	131
Employment	818	1,901	23	17,880	294	131
Assets	648.2	4,311	15.8	49,200.0	78.1	131
Liabilities	157.0	517	0.1	5,295.1	27.7	121

***Notes*:** *Original projects were assigned only to the master firms and to the control group. Hence no information on the number of projects is available for divested units.
All financial indicators are expressed in million CZK. The average exchange rate in the period studied was $1 = 30 CZK.

transfer of ownership rights ended in 1994 or very early 1995, we take 1995 to be the first year after divestitures and privatization that truly reflects the new corporate and ownership structure. Moreover, by 1995 the quality of the reported accounting and economic data by and large reflected the international standards. Finally, using data for both 1995 and 1996 allows us to test for time-varying effects of divestitures and privatization. Hence, in our estimation we use data on early corporate performance in 1990, firm divestitures in 1991–1992 and post-divestiture, post-privatization performance in 1995 and 1996.

Table 4. Proposed allocation of shares among privatizing parties in the winning projects (in %)

		Mean	Standard deviation	Minimum	Maximum
Divested units	Foreign Owner	1.15	6.75	0	51
	Domestic Owner	2.15	9.52	0	52
	Restitution	0.46	2.44	0	18
	Fund of National Property (Temporary)	8.30	14.74	0	57
	Fund of National Property (Permanent)	0.12	0.51	0	3
	Sale through Intermediary	0.34	2.34	0	20
	Municipality Transfer	3.21	8.20	0	67
	Other	0.00	0.00	0	0
Firms without divestitures	Foreign Owner	1.74	9.08	0	75
	Domestic Owner	4.28	14.42	0	84
	Restitution	0.41	2.70	0	58
	Fund of National Property (Temporary)	5.98	13.19	0	82
	Fund of National Property (Permanent)	0.28	3.07	0	45
	Sale through Intermediary	1.83	7.66	0	72
	Municipality Transfer	0.88	2.34	0	20
	Other	0.07	0.94	0	16
Full sample	Foreign Owner	1.66	8.78	0	75
	Domestic Owner	3.97	13.84	0	84
	Restitution	0.42	2.66	0	58
	Fund of National Property (Temporary)	6.31	13.44	0	82
	Fund of National Property (Permanent)	0.26	2.85	0	45
	Sale through Intermediary	1.62	7.16	0	72
	Municipality Transfer	1.22	3.87	0	67
	Other	0.06	0.87	0	16

***Note*:** The number of observations is 131 for divested units, 780 for the control group and 911 for the full sample.

Table 5. Sector distribution of firms (%)

Sector	Divested units	Control group	Full sample
Agriculture	1.5	1.4	1.4
Heavy machinery	48.9	34.6	36.7
Light machinery	13.0	19.6	18.7
Construction	12.2	21.5	20.2
Transportation	2.3	2.4	2.4
Trade	3.1	12.1	10.8
Research and development	1.5	1.9	1.9
Services	13.0	4.0	5.3
Financial	4.6	2.4	2.7

***Note*:** The number of observations is 131 for divested units, 780 for firms without divestitures and 911 for the full sample.

Our data permit us to use three indicators of corporate performance in our main model: unit labour cost measured by labour costs over sales (labour costs/sales), operating profit over labour costs (profit/labour costs), and operating profit per share (profit/equity). Our main analysis is hence based on a measure of (labour) cost effectiveness and two direct measures of profitability. Finally, in our DID analysis, which we perform as an extension reflecting a robustness check, we are able to use sales as a measure of the scale of operation.

4. The estimating framework

We exploit the structure of our data to model the post-divestiture and post-privatization corporate performance in 1995–1996 as a function of the presence or absence of a divestiture and (subsequent) change in the ownership structure, controlling for possible endogeneity of these explanatory variables. Second, as a robust check to our baseline model, we construct a DID estimator, using the fact that we can exactly match divested units in 1995–1996 with their predecessor enterprise operating units in 1991 and have comparable data on one performance indicator (sales) for both of these periods. In other words, for sales we look at the difference in performance between 1995–1996 and 1991 as a function of a divestiture and ownership change, controlling for possible endogeneity of the explanatory variables. Summary statistics of performance indicators are presented in Table 6.

Table 6. Summary statistics of performance indicators: 1995–1996

		Mean	Standard deviation	Minimum	Maximum	Number of Firms
1995						
Divested units	Labour costs	96.4	0.27	1.12	2,405	91
	Sales	1,067.5	5.35	1.59	50,570	91
	Profit/Labour costs	0.5	1.20	–2.70	7	91
	Profit/Equity	0.1	0.2	–0.3	0.9	91
Firms without	Labour costs	82.6	0.14	0.90	2,229	538
divestitures	Sales	558.8	1.72	0.27	29,872	538
	Profit/Labour costs	0.3	0.89	–2.89	7	538
	Profit/Equity	0.1	0.2	–0.3	0.9	538
Full sample	Labour costs	84.6	0.17	0.90	2,405	629
	Sales	632.4	2.58	0.27	50,570	629
	Profit/Labour costs	0.3	0.95	–2.89	7	629
	Profit/Equity	0.1	0.2	–0.3	0.9	629
1996						
Divested units	Labour costs	112.5	0.32	4.73	2,818	86
	Sales	1,210.9	6.03	2.08	55,495	86
	Profit/Labour costs	0.4	1.01	–2.36	6	86
	Profit/Equity	0.1	0.2	–0.3	0.9	86
Firms without	Labour costs	91.4	0.16	0.60	2,415	522
divestitures	Sales	536.4	1.20	0.16	17,423	522
	Profit/Labour costs	0.3	0.76	–2.38	6	522
	Profit/Equity	0.1	0.2	–0.3	0.9	522
Full sample	Labour costs	94.3	0.19	0.60	2,818	608
	Sales	631.8	2.53	0.16	55,495	608
	Profit/Labour costs	0.3	0.80	–2.38	6	608
	Profit/Equity	0.1	0.2	–0.3	0.9	608

***Notes*:** Labour costs and Sales are expressed in million CZK. Exchange rates at the end of 1995 and 1996 were $1 = 26.6 CZK and $1 = 27.3 CZK, respectively.

4.1 The main specification

We identify the percentage shares of pre-divestiture capital and labour that each new unit appropriates from the parent (broken up) firm at the time of its division. These are our indicators of the extent of each divestiture and we interact them with the occurrence of a firm's division (divestiture dummy). We use the

1990 ratio of capital in each divested firm to total capital in the former parent enterprise, dK_i, and the 1990 ratio of the number of employees in each divested firm to the total number of employees in the former parent enterprise, dL_i, as explanatory variables capturing the size of the divestiture. Both shares are to a large extent given by the organizational structure of the parent firm before the split. In addition to these key indicators of the extent of divestiture, we use a set of variables to characterize the economic situation in the parent company before the divestiture. Post-divestiture and post-privatization economic performance and ownership structure are the other types of information that we take into account in our analysis.

Formally, we estimate the following model of corporate performance:

$$\pi_i = \alpha_0 X_i - \alpha_1 \mathrm{DIV}_i + \beta \mathrm{OWN(DIV)}_i + \gamma \mathrm{OWN(NoDIV)}_i + \chi dL_i + \delta dK_i + \varepsilon_i \qquad (1)$$

where index i denotes firms, π_i is a measure of corporate performance of firm i after both divestiture and privatization occurred (i.e., in 1995–1996), X_i captures the pre-divestiture, pre-privatization (1990) economic situation in the parent firm measured by assets, liabilities, sales, profit, and number of employees, and DIV_i is a dummy variable coded 1 if the enterprise is a divested unit and 0 if it is a firm that did not experience division. Variables $\mathrm{OWN(DIV)}_i$ and $\mathrm{OWN(NoDIV)}_i$ measure the post-privatization (1995–1996) ownership structure in companies that experienced divestitures and those that did not, respectively, while β and γ are the associated coefficients. Finally, ε_i is the error term.

4.1.1. Endogeneity of divestitures and ownership

Since divestitures and changes in ownership structure may be correlated with firms' unobserved characteristics, we treat the explanatory variables related to divestitures and ownership as endogenous and apply IV estimation. The advantage of the IV procedure over the more efficient maximum likelihood estimation is that it is more robust and does not require numerical integration in the presence of the dummy variable for divestitures and share variable for ownership. We use a logit model to estimate the predicted values of the explanatory variables (divestitures and ownership) and we employ standard non-linear two stage least squares (Wooldridge, 2002, pp. 427–430)[6] in that we use the predicted values from the logit

[6] Conditions for consistency in the non-linear two stage least squares are the same as in the linear version and require exogeneity of the IVs employed. To summarize our estimation method, we begin with modelling corporate performance as a function of the presence or absence of a divestiture and the type of ownership. Due to the potential endogeneity of explanatory variables, we use a logit equation to model the divestiture of a company and subsequent changes in its ownership structure. We then use the predicted values from the logit as instruments in our model of corporate performance. Thus, instead of using a linear projection of the endogenous variables onto the space of exogenous variables, we use logit-model-based predicted values constructed from exogenous variables that pass the tests as legitimate instruments.

as instruments in the main Model (1) to obtain consistent estimates.[7] In particular, for the first stage regression we use the following logit model to estimate the probability of a divestiture occurring:

$$\mathrm{DIV}_i = f\left(NP_i, \sum_{j=1}^{3} (\mathrm{DE}_i)^j, \mathrm{POWN}_i, \sum_{j=1}^{2} (\mathrm{PP}_i)^j \right) + v_i \qquad (2)$$

where $\mathrm{DIV}_i = 1$ if company i is a divested unit and 0 otherwise, NP_i refers to the number of privatization projects submitted to the government in 1991 (more discussion below), DE_i captures how much the size of each firm deviates in 1990 from the standard in the OECD economies (discussed below), POWN_i stands for the ownership structure proposed in 1991 in the winning privatization project (expressed as the percentage intended for each ownership type defined by categories listed in Table 4), PP_i measures the profitability of the parent firm in 1990 (Table 3), and PTNS_i represents the total number of shares per parent firm in 1990. The effects of variables such as the firm's distance from the mean OECD size, profitability, and total number of shares may be non-linear and we therefore use a Taylor series expansion of the second and third order to formulate a specification that takes into account potential non-linearities (the order of expansion is denoted by j in Equation (2)).

Finding valid IVs is always a challenge and our case is no exception. Nevertheless, the fact that we are able to use as IVs firm-specific variables whose values were set by planners centrally and independently of what firms would subsequently do in a market setting, makes our IVs more likely to satisfy the orthogonality assumption in the second stage of estimation than would the use of similar IVs in both more and less developed market economies. For example, the planners tended to establish and maintain very large firms, both because it was easier to control a few large (rather than many small) firms and because of the prevailing political philosophy of building large firms under communism. Econometrically, we find that all the IVs described above pass the formal Sargan-Wu, Hansen J and Bassman tests of over-identifying restrictions at the 1 percent test level and in this sense they qualify as valid instruments.

From the first stage regression results on the divestiture occurrence, we detect that the IVs are strongly pre-determined through time and have the intuitively expected effects (see Table A1 in the Appendix). For example, the number of privatization projects submitted in 1991 (NP_i) is naturally a good instrument since it is unlikely to be correlated with potential omitted variables affecting performance in 1996. There are two reasons for this lack of correlation. First, the number of

[7] We have also carried out a sensitivity analysis in which we have adopted a linear probability model instead of the logit specification. In this case we estimate a standard two stage least squares model. The estimates from the two approaches are not materially different.

submitted projects is highly correlated with the number of separable divisions (units) that the parent firms had in 1990–1991 and that could be easily divested. Hence it is the number of divisions established by planners rather than inherently superior performance in a market economy that was the key determinant of the number of privatization projects submitted per firm. Furthermore, given that privatization projects were submitted under the old, pre-transition regime in 1991 and performance is measured in a market economy five years later, it is unlikely that the 1995–1996 performance of a private firm and its management is related to the number of privatization projects submitted to the state five years earlier.

Another instrument that we use is the variable DE_i, measuring the number of employees in a firm in 1990 minus the number of employees in a (weighted) average firm belonging to the same industrial sector in the OECD economies at the same period (see Kumar, Rajan and Zingales, 1999).[8] We take the mean OECD firm size as a benchmark because the transition countries declared their commitment to move towards a standard market economy and many, including the Czech Republic, succeeded in joining OECD soon after the start of the transition. One of the determining factors for a divestiture is therefore likely to be the size of the firms that emerged from the centrally planned system, relative to the size of firms in established market (OECD) economies. Since the socialist planners preferred large firms, the variable DE_i captures well the excessive size of enterprises under central planning relative to firm size in market economies and serves as a good instrument.

Overall, the predictive power of the first-stage regressions is very high. Specifically, in terms of the fraction of correct predictions for the divestment and non-divestment categories, the fraction is 97 percent, and this value passed the standard χ^2-test for significance of predictions at the 2 percent level.

We use the following regression to instrument the ownership structure observed in 1995 and 1996 (OWN_i):

$$OWN_i = f\left(NP_i, POWN_i, IND_i, \sum_{j=1}^{3}(PTNS_i)^j, \sum_{j=1}^{3}(AP_i)^j, \sum_{j=1}^{3}(PIFh_i, IIh_i)^j\right) + \zeta_i, \qquad (3)$$

where IND_i is a set of one-digit industry dummies and AP_i is the average price per share of company i in the voucher privatization scheme. $PIFh_i$ and IIh_i are the shares of company i allocated to privatization investment funds and individual investors, respectively, during the large-scale privatization in 1992. The effects of variables such as the firm's total number of shares ($PTNS_i$) and shares allocated to the institutional ($PIFh_i$) and individual (IIh_i) investors may be non-linear, and we

[8] We have used both the mean and median firm size and the results are similar. The mean and median numbers of employees by industrial sector in OECD countries are given in Kumar, Rajan and Zingales (1999; Table 2).

therefore use a Taylor series expansion of the third order to take into account potential non-linearities.[9]

As in the case of the divestiture Equation (2), all the instruments used in specification Equation (3) pass the formal Sargan-Wu, Hansen and Bassman tests at the 1 percent test level and thus qualify as valid instruments. They are strongly pre-determined through time with intuitively expected effects and the predictive power of the first-stage regressions is very high. The fraction of correct predictions for the observed ownership structure ranges from 93.5 to 97.3 percent, depending on the type of ownership, and these values passed the standard χ^2-test for significance of predictions at the 1 percent level.

The first stage regression results on ownership structure are reported in the Appendix, Table A2. These results are of independent interest. Specifically, the role of the state in privatized firms can be detected from the variables of the temporary and permanent presence of the state in firms (the variable is coded as Fund of National Property). The temporary effect of the state is positive for banks, portfolio companies, and undistinguished foreign owners, where the presence of the state has attracted these types of owners. The negative effect in the case of investment funds and foreign investment companies may be viewed as if the presence of the state repelled investment funds and foreign owners for not being able to effectively control a firm. These effects are in line with the prolonged control of the state (via share holdings) in numerous firms long after their privatization (see Hanousek and Kočenda, 2007).

4.1.2. Selection bias due to attrition

In estimating Equation (1), we may experience a selection bias because about 24 percent of firms observed in 1990 do not report data for 1995–1996. The bias may be present despite the fact that attrition occurred similarly in the groups of firms that experienced divestitures and those that did not. We therefore use the Heckman (1979) procedure to correct for this bias by estimating a selection equation and inserting the resulting inverse Mills ratio into Equation (1). The selection probit equation is specified as

$$M_i = g\left(\mathrm{AP}_i, \sum_{j=1}^{3} (\mathrm{PTNS}_i)^j, \mathrm{PIFh}_i, V_i, \mathrm{IND}_i \right) + \eta_i, \tag{4}$$

where M_i equals zero if company i has missing performance data in 1995–1996 and V_i refers to the percentage of company shares sold in the voucher scheme. The estimated coefficients from this auxiliary probit regression are available upon request.

[9] The logit specification in Equation (2) resulted from the standard Heckman correction procedure. In specification Equation (3) we can use either probit or logit. We prefer logit, since it is less sensitive to the actual distribution of the error term. For the sake of consistency we employed both methods and found them to yield similar results. The goodness of fit, measured by an adjusted R^2, ranges from 0.09 to 0.1. Note that goodness of fit is not an issue here because specification Equation (3) is a correction equation. In this case poor fit could be interpreted as resulting from the fact that missing observations in Equation (1) are randomly distributed.

4.2 Robustness check: DID

As a robustness check to our baseline model, we carry out a DID estimation for the one variable – sales revenue – for which we have comparable data in both 1990 and 1995–1996. In particular, for sales – a key variable capturing the scale of operations and hence both performance and restructuring – we have comparable 1990 and 1995–1996 data on the divested units within the parent firms and on the firms that did not experience divestitures. The problem that we face with respect to the other dependent variables used in our baseline model is that the (command system) variable definitions in 1990 differ dramatically from the (international) definitions used by firms in 1995–1996.[10] For sales, however, the definitions are similar and we can employ the DID method as a robustness check to Equation (1), taking the divestiture and privatization as the treatment variables that may alter the performance of the firm.[11]

Taking into account other potentially relevant variables, our specification of the DID model is

$$\Delta\pi_i = \alpha\Delta\mathrm{DIV}_i + \beta\Delta\mathrm{OWN(DIV)}_i + \gamma\Delta\mathrm{OWN(NoDIV)}_i + \chi\mathrm{d}L_i + \delta\mathrm{d}K_i + \phi\mathrm{MR}_i + \varepsilon_i \qquad (5)$$

where $\Delta\pi_i$ is a measure of the difference in sales between 1990 and 1995–1996, $\Delta\mathrm{DIV}_i$ is a divestiture dummy coded 1 if the firm is a divested unit and zero otherwise, and $\Delta\mathrm{OWN\ (DIV)}_i$ and $\Delta\mathrm{OWN\ (NoDIV)}_i$ capture the change in ownership structure between 1990 and 1995–1996 for firms that experienced divestiture and those that did not, respectively. In this context, the pre-divestiture, pre-privatization ownership is 100 percent state ownership.[12] Since we use the DID approach, $\Delta\mathrm{OWN}_i$ captures the diminished share of state ownership and the increase in private ownership as compared to the pre-privatization stage. Thus, in the case of state ownership, a value of the variable of 0.3 stands for a 30 percent decrease in state ownership (for example, from 100 to 70 percent). A negative coefficient on the change in state ownership variable thus implies an improvement in performance with declining state ownership. For private types of ownership the interpretation is analogous, with a

[10] For example, unsold inventories were included as part of a firm's profit in 1990 but not in 1995–1996, and artificial invoicing was common in 1990 as invoiced products were included in profit and improved the firm's image. Thus, using profit in the DID estimation would most probably yield distorted results. In the period after privatization (from the end of 1994 on) accounting rules conforming to the international (IAP) standard were already in place. They are different from those used prior to 1991 when the majority of divestitures took place.

[11] In Equation (1) we control for the 1990 values of key performance variables by including them as regressors X_i, but we do not constrain the dependent variable to be in the form of a difference between the 1995–1996 and 1990 values.

[12] We use the pre-divestiture, pre-privatization ownership structure in 1990 and the post-divestiture, post-privatization one in 1995 and 1996. Privatization of firms within the first wave of the voucher scheme was concluded in 1993 and 1994, but it was not until 1995 that new owners could affect ownership structure or execute sovereign corporate governance in privatized and spun-off firms. See Hanousek, Kočenda and Svejnar, 2007 for the post-1996 developments in privatized firms.

positive coefficient implying that performance improves with an increase in private ownership. In this context, coefficient β captures the interaction effect of the split and subsequent change in ownership, while coefficient γ gives the effect of ownership change in a firm without a divestiture. Finally, MR_i is the Mills ratio from the Heckman correction (Equation 3) and dK_i and dL_i are as in the specification Equation (1).

The validity of the DID estimates may be affected by the potential endogeneity of the treatment variables, in our case divestitures and privatization. To overcome this problem, we use the approach and variables as defined in Equations (2) and (3), respectively. Since shares of labour and capital interact with the process of a firm's division, we also instrument the capital and labour ratios. The IVs that we use are industry-specific average dK and dL for groups of firms that did not experience divestitures. Due to the absence of divestiture, the size of these firms can be considered as being appropriate with respect to ratios of labour and capital in a particular sector. Most importantly, the computed average is not correlated with the error term in Equation (5) that considers only firms where divestiture occurred. Furthermore, we use the series of average dK and dL for groups of all firms across various industry sectors. This average ratio is computed for all firms within a sector, with each firm experiencing division being consecutively omitted one at a time so that a large set of averages is available. Omitting a firm that experienced division eliminates potential correlation with the error term and an average constructed this way is by definition a valid instrument. Finally, we also use one-digit industry dummy variables as instruments.

The standard errors of the DID estimates may also be biased as a result of serial correlation. Fortunately, in our case this is not a concern because the time dimension of our panel data is very short and the cross-section dimension quite large. Nevertheless, to check the sensitivity of our results, we have also generated estimates based on data that were aggregated into one observation before and one after the treatment. The results are not materially different.

5. Empirical results

The estimated coefficients of Equation (1) are reported in Table 7. We start by estimating the effect of the extent of a divestiture by interacting the share of labour dL as well as the share of capital dK in the divested unit with annual dummy variables for 1995 and 1996, respectively. This time-varying coefficient specification generated similar 1995 and 1996 point estimates of the corresponding coefficients. We have therefore performed F-tests to verify whether the separate effects for 1995 and 1996 could be constrained into a single coefficient for each variable. In all cases, we have been able to accept the restricted model. In Table 7, we report estimates from this more parsimonious specification.

As mentioned earlier, there is an important discrepancy in the divestiture literature between the specification of Cusatis, Miles and Woolridge (1993), who

Table 7. Effects of divestitures and changes in ownership structure on performance (Instrumental Variable (IV) estimates; standard errors in parentheses)

Dependent variable	Labour costs/sales	Profit/labour costs	Profit/equity
Effects of divestitures			
DIV (base effect)	–0.009	0.991[5]	0.174[1]
	(0.028)	(0.460)	(0.066)
d*L* (share of original labour force)	0.018	0.153	0.073[5]
	(0.033)	(0.164)	(0.039)
d*K* (share of original capital)	–0.529[5]	0.026	–0.074
	(0.027)	(0.247)	(0.042)
Effects of ownership structure: divested units			
Industrial firm	–0.693[1]	–2.302	–0.603
	(0.264)	(2.408)	(0.442)
Financial company	0.332	–8.248[5]	–1.310
	(0.301)	(3.808)	(0.573)
Individual owner	0.111	–18.628[5]	–1.878
	(0.669)	(9.518)	(1.471)
State	0.303	–8.631	–1.297
	(0.558)	(6.596)	(1.227)
Effect of ownership structure: control group of firms with no divestitures			
Industrial firm	–0.45[1]	0.853	0.731[5]
	(0.109)	(0.600)	(0.235)
Financial company	0.277[5]	0.096	–0.098
	(0.121)	(0.722)	(0.321)
Individual owner	0.445[10]	–1.794	0.016
	(0.263)	(1.680)	(0.756)
State	0.233	–2.638[10]	–1.388[10]
	(0.234)	(1.507)	(0.861)
Constant	0.241[1]	1.201[1]	0.290
	(0.021)	(0.270)	(0.129)
Mills ratio	0.033	–1.225	–0.270[1]
	(0.028)	(0.282)	(0.129)
Pre-split performance indicators	*Yes*	*Yes*	*Yes*
R^2	0.061	0.072	0.153
Adjusted R^2	0.047	0.058	0.140
Number of observations	1,280	1,279	1,234
Hausman test (degrees of freedom)	102.3 (6)	48.9 (8)	422.9 (7)
Upper tail area	< 0.01	< 0.01	< 0.01

***Notes*:** Since after a divestiture and subsequent privatization the state reduces its share, the coefficients associated with state ownership refer to a reduction of state ownership. The category Financial company includes ownership by banks, privatization investment funds and financial intermediaries/brokerages. Ownership coefficients and associated standard errors (in parentheses) are multiplied by a factor of 100 for ease of interpretation. 1, 5 and 10 denote significant at 1 percent, 5 percent, 10 percent statistical test level, respectively.

control for ownership changes in analyzing divestitures, and the rest of the literature that does not. To check the validity of the maintained assumption in the rest of the literature, namely that one can ignore ownership effects, we have tested whether our data permit us to exclude the ownership variables from the estimating equations. The relevant *F*-tests indicate that specifications that exclude the ownership variables are mis-specified. Our results therefore suggest that analyses of divestitures ought to take into account the accompanying changes in the ownership structure.

Finally, the Hausman (1978) tests for endogeneity of divestitures and ownership indicate that the IV method is superior to OLS in all regressions. In Tables 7 and 8 we report the IV estimates, noting that we do not have an excessive number of instruments and that our regressions pass the test of over-identifying restrictions. These tests suggest that the literature on divestitures needs to take into account the fact that divestitures and ownership changes may be endogenously determined rather than brought about by a random assignment.

The estimated coefficient on the occurrence of divestiture (DIV) in Table 7 indicates that the base effect of divestitures is insignificant for labour cost/sales, but positive and statistically significant for profit/labour costs and profit/equity. Holding the relative factor intensity of the divestitures constant, the base performance effect of divestitures is positive for the two measures of profitability, but insignificant for the unit labour cost.

The effect of divestitures on profit/equity varies significantly with both dL and dK, the effect on labour cost/sales varies with dK only and the effect on profit/labour cost is invariant with respect to the labour and capital intensity of the divested unit. In particular, the effect of dL is positive and significant on profit/equity and insignificant on labour costs/sales and profit/labour cost. The effect of increasing the divestiture in terms of the labour share of the original parent firm is therefore to increase or leave unaffected the divested unit's profitability and leave unchanged its unit labour cost.

The effect of dK on labour costs/sales is negative, suggesting that larger divestitures in terms of the share of capital appropriated from the parent firm are more efficient in that they decrease the unit labour cost of the divested firm. As was the case with dL, the effect of dK on profit/labour cost is insignificant. However, its effect on profit/equity is negative and significant. The effect of increasing a divestiture's share of parent firm's capital is therefore to enlarge the newly emerged firms' (labour) cost efficiency and decrease or leave unaffected its profitability.

Given that the effects of divestitures vary in terms of the base effect and the size of the divestiture in terms of dL and dK, it is informative to calculate the mean effect of divestitures on each indicator of performance. When we take into account the effect of the base (DIV) and evaluate the performance effects of divestitures at the mean values of dL and dK, using the estimated variance–covariance matrix, we find that the mean effects (and corresponding standard errors) are –0.010 (0.029) for labour cost/sales, 1.011 (0.505) for profit/labour cost, and 0.170 (0.066) for profit/equity. The three effects point in the direction of divestitures reducing costs

Table 8. Effect of divestiture-related characteristics on performance: Difference-in-difference Instrumental Variable (IV) estimates (standard errors in parentheses)

	ln sales
	IV
Effects of divestitures	
DIV (base effect)	18.213[10]
	(9.828)
d*L* (share of original labour force)	0.022
	(0.168)
d*K* (share of original capital)	–0.092
	(0.082)
Effects of ownership structure: divested units	
Industrial firm	7.251
	(4.731)
Financial company	1.313
	(5.372)
Individual owner	8.741
	(11.416)
State	–17.099[10]
	(9.849)
Effect of ownership structure: control group of firms with no divestitures	
Industrial firm	0.270
	(1.533)
Financial company	–5.688[1]
	(1.454)
Individual owner	–5.902[10]
	(3.507)
State	2.299[1]
	(0.291)
Mills ratio	–5.211[1]
	(0.431)
R^2	0.130
Adjusted R^2	0.122
Number of observations	1347
Hausman test (degrees of freedom)	22.238
Upper tail area	< 0.01

***Notes*:** Since we define all ownership categories in terms of a change in ownership between 1990 and 1995–1996, the state ownership variable refers to the reduction of the state's share while for the remaining categories this difference reflects an increase. The category Financial company includes ownership by banks, privatization investment funds, and financial intermediaries/brokerages. Ownership coefficients and associated standard errors (in parentheses) are multiplied by a factor of 100 for ease of interpretation. 1, 5, and 10 denote significant at 1 percent, 5 percent, 10 percent statistical test level, respectively.

and increasing profitability. However, only the two average effects on the profitability indicators are statistically significant. This is because the statistical significance of the base effect (DIV) dominates in the calculation of the statistical significance of the average effect. The average divestiture therefore has a positive and statistically significant effect on both measures of profitability, and a statistically insignificant negative effect on the unit labour cost. Given that the average value of profit/labour cost and profit/equity are equal to 0.317 and 0.132, respectively, the mean effect of divestitures on the profitability of firms is large.

The effects of ownership changes on performance vary with the type of owner and whether or not the firm is the result of a divestiture. With the ownership coefficients and standard errors in Table 7 being multiplied by a factor of 100 for ease of interpretation, and with dispersed ownership serving as the base with its effect contained in the constant term, one can see that the extent of state ownership does not much affect performance in either type of firm. The only effects of state ownership that are statistically significant or close to being significant are the negative effects on the two measures of profitability in firms that did not experience divestiture. Reducing state ownership during large scale privatization thus has limited positive effects on the profitability of firms that did not experience divestitures, while the effect on newly emerged units is insignificant.

Ownership of firms by an industrial (i.e., non-financial) company has positive or insignificant effects on performance, relative to dispersed ownership. Greater ownership by an industrial company decreases labour costs/sales in both the divested units and firms that do not experience divestitures, and it also increases profit/equity in firms that were not divided. With other effects being insignificant, industrial firms as new owners hence improve cost efficiency and leave unchanged or improve profitability.

Financial companies and individuals, on the other hand, appear to be owners that do not improve, and in several aspects reduce, efficiency. Financial companies have a negative effect on both measures of profitability in the divested firms and also a positive effect on unit labour cost in firms without divestment. Greater ownership by individuals has a similarly non-positive effect, with the coefficients being mostly insignificant, the effect on profit/labour cost being negative for divestitures and the effect on unit labour cost being positive for firms without divestitures.

The above results, based on the IV estimation, can be contrasted with those obtained from the standard OLS. For the sake of the completeness of our analysis, we present these results in Table A3 in the Appendix, despite their inaccuracy. The effects of the share of labour force and capital are reasonably similar to those reported in Table 7 because the two variables are more or less exogenous by their nature and are used only as control variables. The effects of divestitures and ownership type vary greatly from those obtained by the IV estimation and demonstrate the urgent need to account for endogeneity of divestment and privatization.

In Table 8 we report the DID estimates that capture the effect of divestitures and privatization on (growth of) sales. The base effect of divestitures is large (18 percent),

positive and statistically significant at a 7 percent two-tail test level. The coefficients on d*L* and d*K* are insignificant, indicating that the strong positive effect of divestitures on the scale of operations (proxied by the logarithm of sales) does not vary with the size of the divestiture. This finding broadens the support for our conclusions based on the estimates of Equation (1) that divestitures have a positive effect on corporate performance.

The DID effects of changes in ownership structure are varied. A greater reduction of state ownership results in higher sales in divested units but lower sales in firms without divestitures. In the case of divestitures, the effect of reducing state ownership stands out against the positive and uniform effect across all other types of ownership. In firms without divestitures, there is no significant sales effect associated with ownership by an industrial company, but there is a negative sales effect associated with ownership by financial companies and individuals, and a positive effect associated with state ownership.

6. Conclusions

Our study, based on new data from a rapidly emerging market economy (Czech Republic), suggests that divestitures and changes in ownership have a number of significant but also some insignificant effects on the performance of firms. We show that divestitures increase firms' indicators of profitability and scale of operations (sales), but do not reduce in a significant way their unit labour cost. The performance effects of privatization depend on the resulting ownership structure and on whether or not a firm experienced a divestiture. In particular, smaller state ownership does not result in uniform and widespread improvements in performance. It has a weakly significant positive effect on profitability of firms without divestitures, relative to other types of ownership, but other effects are insignificant or mixed. Industrial (non-financial) firms as owners reduce unit labour cost and leave unchanged or increase profitability. Greater ownership by financial companies or individuals reduces profitability in divested firms and increases unit labour cost and reduces sales in firms without divestment.

The overall evidence for divestitures is thus consistent with our first hypothesis, namely that divestitures have a positive effect on performance. A positive effect of divestiture on profitability without reducing costs can be credited to the increased market power of the divested firms. Since the socialist planners preferred large firms, the sizes of the firms that emerged from the centrally planned system were considerably larger than the size of firms in the established-market economies (OECD). The divestitures of the large SOEs into smaller units combined with their privatization eliminated prior inefficiencies such as diseconomies of scale of large state conglomerates, weak managerial incentives, and information asymmetries. Divestitures also enabled firms to become more specialized and focused on their core competence.

The effect of privatization is more nuanced. Reducing state ownership *per se* is positive for some performance indicators in the case of firms without divestitures, but it is less so in the divested units. Industrial firms as owners improve or do not hamper performance and in that sense they behave consistently with our first hypothesis. Financial companies and individuals as owners are mostly associated with no improvement and in some cases significant declines in performance, thus providing evidence that is consistent with our second hypothesis related to waning government controls, unclear corporate governance, and a weak market-oriented legal framework. The effects of privatization are therefore more nuanced than was suggested in many of the early studies.

Methodologically, our study provides evidence that it is important to (i) take into account changes in ownership when analyzing the effect of divestitures, and (ii) control for endogeneity, selection and data attrition when analyzing the effects of divestitures and privatization.

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Appendix

Table A1. First stage regression results on the occurrence of divestiture (Equation 2)

Variable	Coefficient	Significance	d*P*/d*x*
Total number of privatization projects	0.201	1	0.014
	(0.047)		
(Total number of privatization projects)^2	–0.006	1	–0.00003
	(0.002)		
DE_i average	0.001	1	0.0001
	(0.0006)		
(DE_i average)^2	–1e–8		–4e–9
	(2e–7)		

Table A1. (cont) First stage regression results on the occurrence of divestiture (Equation 2)

Variable	Coefficient	Significance	d*P*/d*x*
$(DE_i \text{ average})^3$	3e–10	5	2e–12
	(1e–10)		
DE_i median	–0.001	5	–8e–5
	(0.0005)		
$(DE_i \text{ median})^2$	4e–6		3e–9
	(2e–6)		
$(DE_i \text{ median})^3$	–3e–9	5	–2e–12
	(1e–10)		
Foreign owner	–0.007		–4e–4
	(0.014)		
Domestic owner	–0.0002		–1e–5
	(0.007)		
Restitution	–4e–4		–3e–5
	(0.040)		
Fund of national property (temporary)	0.009		6e–4
	(0.006)		
Fund of national property (permanent)	–0.029		–0.002
	(0.043)		
Municipality transfer	0.018		0.001
	(0.030)		
Profit (parent)	0.248		0.017
	(0.178)		
[Profit (parent)]^2	–0.018		–0.001
	(0.028)		
Sales (parent)	0.082	5	0.006
	(0.039)		
[Sales (parent)]^2	–0.002	5	–0.0001
	(0.001)		
Total number of shares (billion)	1.020	1	0.071
	(0.412)		
[Total number of shares (billion)]^2	–0.205	5	–0.014
	(0.102)		
[Total number of shares (billion)]^3	0.003	5	2e–4
	(0.001)		
Industrial dummies		Yes	
R^2		0.286	

Table A2. First stage regression results on the ownership structure (Equation 3)

	Domestic owners														Foreign owners					
	Industrial company			Bank			Investment fund			Individual			Portfolio company			Industrial company			Others		
	Coeffi-cient	Signi-ficant	d*P*/d*x*	Coeffi-cient	Signi-ficant	d*P*/d*x*	Coeffi-cient	Signi-ficant	d*P*/d*x*	Coeffi-cient	Signi-ficant	d*P*/d*x*	Coeffi-cient	Signi-ficant	d*P*/d*x*	Coeffi-cient	Signi-ficant	d*P*/d*x*	Coeffi-cient	Signi-ficant	d*P*/d*x*
Variable																					
Constant	−2.201		−0.43	−15.28	5	**−0.206**	−3.120		**−0.432**	−2.049		**−0.131**	−4.521		**−0.164**	3.193		**0.175**	−17.51	1	−0.289
	(1.564)			(6.273)			(2.084)			(3.063)			(3.583)			(3.061)			(6.461)		
Total number of shares (millions)	0.448		0.09	3.956	5	**0.0533**	1.195		**0.1656**	5.696		**0.3653**	−3.919		**−0.142**	−3.923	5	**−0.21**	8.497	5	0.14
	−0.376			(1.650)			(1.19)			(3.98)			(4.41)			(1.76)			(3.39)		
[Total number of shares (millions)]^2	−0.013		0.00	−0.403		**−0.005**	−0.607	1	**−0.084**	−1.948		**−0.125**	−0.917		**−0.033**	−0.770		**−0.04**	−0.835	10	−0.014
	(0.021)			(0.028)			(0.019)			(2.00)			(0.086)			(0.062)			(0.047)		
Shares in the voucher scheme (millions)	−0.243		−0.05	−12.449		**−0.168**	−0.010		**−0.001**	1.701		**0.1091**	−12.350		**−0.448**	0.908		**0.05**	−31.065	10	−0.512
	(2.27)			(9.96)			(3.34)			(7.31)			(13.1)			(6.5)			(16.6)		
Sold shares (millions)	−0.126		−0.02	9.999		**0.1348**	1.424		**0.1973**	−10.177		**−0.653**	20.107		**0.73**	5.716		**0.312**	24.416	10	0.402
	(2.16)			(9.37)			(3.04)			(6.53)			(12.7)			(6.28)			(14.8)		
Sold points (millions)	0.000		0.00	0.043		**0.5829**	0.000	5	**−0.005**	−0.005		**−0.302**	0.000	10	**−0.004**	0.000	5	**0.003**	0.131		0.216
	(0.012)			(0.029)			(0.019)			(0.0479)			(0.062)			(0.025)			(0.040)		
	(0.0102)			(0.0279)			(0.0102)			(0.0267)			(0.0779)			(0.0265)			(0.875)		
Foreign owner	−0.055		−0.01			**0**	−0.033		**−0.005**			**0**			**0**			**0**			0
	(0.0208)						(0.0254)														
Domestic owner	0.022		0.00	0.132	1	**0.002**	−0.028	10	**−0.004**	−0.00361		**0**	0.021		**0.001**	−0.0802	1	**−0**	0.0123		0
	(0.009)			(0.0378)			(0.0166)			(0.0179)			(0.0197)			(0.0185)			(0.0349)		
Restitution	0.073		0.01	0.275		**0.004**	−0.013		**−0.002**	−0.142		**−0.009**	−0.389		**−0.014**	0.0723		**0.004**			0
	(0.052)			(0.198)			(0.0628)			(0.175)			(0.328)			(0.068)					

Table A2. (cont) First stage regression results on the ownership structure (Equation 3)

	Domestic owners															Foreign owners					
	Industrial company			Bank			Investment fund			Individual			Portfolio company			Industrial company			Others		
	Coeffi-cient	Signi-ficant	d*P*/d*x*	Coeffi-cient	Signi-ficant	d*P*/d*x*	Coeffi-cient	Signi-ficant	d*P*/d*x*	Coeffi-cient	Signi-ficant	d*P*/d*x*	Coeffi-cient	Signi-ficant	d*P*/d*x*	Coeffi-cient	Signi-ficant	d*P*/d*x*	Coeffi-cient	Signi-ficant	d*P*/d*x*
Variable																					
Fund of national property (temporary)	–0.011 (0.009)		0.00	0.0706 (0.0293)	5	**0.001**	–0.025 (0.0148)	10	**–0.003**	–0.0105 (0.019)		**–0.001**	0.0306 (0.0162)	10	**0.001**	–0.028 (0.0127)	5	**–0**	0.0574 (0.0246)	5	0.001
Fund of national property (permanent)	0.011 (0.073)		0.00			**0**	–0.061 (0.143)		**–0.008**	–0.0798 (0.139)		**–0.005**	0.109 (0.0843)		**0.004**			**0**			0
Sale through intermediary	0.008 (0.011)		0.00	–0.0061 (0.0667)		**0**	0.025 (0.0147)	10	**0.003**	–0.00773 (0.0227)		**0**			**0**	–0.0498 (0.0149)	1	**–0**	0.0338 (0.0474)		0.001
Municipality transfer	–0.126 (0.035)		–0.03	–0.0073 (0.123)		**0**	–0.011 (0.02)		**–0.002**	–0.0835 (0.0705)		**–0.005**	0.0006 (0.0406)		**0**	–0.0427 (0.019)	5	**–0**	0.0838 (0.0383)	5	0.001
Other	0.041 (0.014)		0.01			**0**	–0.048 (0.0342)		**–0.007**	–0.165 (0.0692)	5	**–0.011**	0.0193 (0.0471)		**0.001**	–0.0684 (0.0232)	1	**–0**	–0.171 (0.187)		–0.003
Privatized in voucher scheme	0.002 (0.009)		0.00	0.091 (0.0324)	1	**0.001**	0.032 (0.0143)	5	**0.004**	0.0178 (0.02)		**0.001**	0.0274 (0.0206)		**0.001**	–0.0948 (0.0153)	1	**–0.01**	0.123 (0.0437)	1	0.002
Share average price in voucher scheme	–0.001 (0.00445)		0.00	0.00965 (0.0142)		**0**	0.017 (0.00842)	5	**0.002**	–0.0117 (0.0119)		**–0.001**	0.0402 (0.0222)	10	**0.001**	0.00588 (0.0104)		**0**	0.0261 (0.0179)		0
[Share average price in voucher scheme]^2	0.000 (1.23E–05)		0.00	8.9E–06 (3.15E–05)		**0**	0.000 (3.56E–05)		**0**	4.39E–06 (4.46E–05)		**0**	–0.0002 (0.000129)	10	**0**	–2.9E–05 (3.16E–05)		**0**	2.95E–06 3.81E–05)		0
Total number of privatization projects	0.026 (0.0102)		0.01	0.0844 (0.0279)	1	**0.001**	0.016 (0.0102)		**0.002**	–0.0137 (0.0267)		**–0.001**	–0.0786 (0.0779)		**–0.003**	–0.0126 (0.0265)		**–0**	–1.247 (0.875)		–0.021
Pre-privatization characteristics	Yes			yes			yes			yes			yes			yes			yes		
R^2 (scaled)	**0.175**	1		**0.464**	1		**0.219**	1		**0.157**	1		**0.142**	1		**0.386**	1		**0.325**	1	

Table A3. Inaccurate effects of divestitures and changes in ownership structure on performance (Ordinary Least Squares (OLS) estimates; standard errors in parentheses)

Dependent variable	Labour costs/sales	Profit/labour costs	Profit/ equity
Effects of divestitures			
DIV (base effect)	–0.011	–0.002	–0.0551
	(0.012)	(0.325)	(0.054)
d*L* (share of original labour force)	0.022	0.216	0.0765
	(0.037)	(0.495)	(0.079)
d*K* (share of original capital)	–0.522[5]	0.324	0.153
	(0.031)	(0.580)	(0.146)
Effects of ownership structure: divested units			
Industrial firm	–0.215[1]	0.033	–0.068
	(0.082)	(1.080)	(0.101)
Financial company	0.088	7.574[1]	0.530[1]
	(0.172)	(2.531)	(0.146)
Individual owner	0.018	–0.743	–0.034
	(0.103)	(1.020)	(0.106)
State	0.089	–1.599	0.299
	(0.173)	(3.142)	(201)
Effect of ownership structure: control group of firms with no divestitures			
Industrial firm	–0.081[1]	1.600	0.059
	(0.019)	(1.247)	(0.061)
Financial company	0.018	0.127	0.002
	(0.025)	(1.476)	(0.042)
Individual owner	0.011	–10.024	0.104
	(0.052)	(10.770)	(0.161)
State	0.154	–22.172	0.142
	(0.126)	(24.587)	(0.170)
Constant	0.232[1]	1.597[10]	0.207[1]
	(0.012)	(0.904)	(0.077)
Mills ratio	0.033	–2.204[5]	–0.213[1]
	(0.028)	(1.113)	(0.092)
Pre-split performance indicators	*Yes*	*Yes*	*Yes*
Adjusted R^2	0.053	0.064	0.151
Number of observations	1,280	1,279	1,234

***Notes*:** Since after a divestiture and subsequent privatization the state reduces its share, the coefficients associated with state ownership refer to a reduction of state ownership. The category financial company includes ownership by banks, privatization investment funds and financial intermediaries/brokerages. Ownership coefficients and associated standard errors (in parentheses) are multiplied by a factor of 100 for ease of interpretation. 1, 5 and 10 denote significant at 1 percent, 5 percent, 10 percent statistical test level, respectively.